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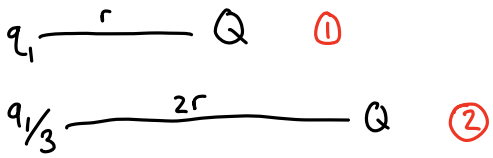
Dr. Middleton PHYS 132 HW
2-6-17

CQ's : 1,2 Ch. 28
Probs : 6,36

Conceptual

28.C.1

a.) $u = \frac{Kq_1q_2}{r}$



$u_1 = \frac{Kq_1Q}{r}$

$u_2 = \frac{Kq_1Q}{3(2r)} = \frac{Kq_1Q}{6r}$

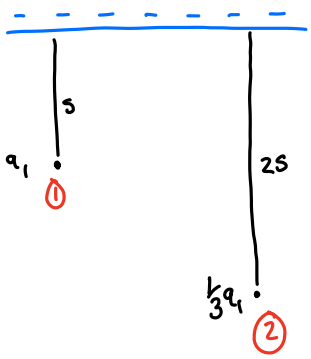
$\frac{u_1}{u_2} = \frac{\frac{Kq_1Q}{r}}{\frac{Kq_1Q}{6r}} = u_1/u_2 = 6$

a.) $u_1/u_2 = 6$

b.) $u_1/u_2 = 3/2$

b.)

$u = qES$



① $u = qES$

② $u = \frac{1}{3}q_1E2s$
$= \frac{2}{3}q_1Es$

$\frac{u_1}{u_2} = \frac{q_1Es}{\frac{1}{3}q_1E2s} = \frac{1}{\frac{2}{3}} = \frac{3}{2}$

$u_1/u_2 = 3/2$

28.C.2

a.) $q_1 = +e$
$q_2 = +82e$

$u = \frac{Kq_1q_2}{r}$

$r = 10$ fm

$u = \frac{K(82e)(e)}{10\times10^{-15}m}$

$u = \frac{K82e^2}{10\times10^{-15}m}$

$E_i = E_f$

$\cancel{U_i} + K_i = u_f + \cancel{K_f}$
(0, 0)

$K_i = u_f$

$u_f = K_i$

$K_i = 1.89\times10^{-12}$ J

$u_f = \frac{K(82e)(e)}{10\times10^{-15}m}$

$= \frac{9.0\times10^9 \frac{Nm^2}{C^2}(82e^2)}{10\times10^{-15}m}$

$u_f = 1.89\times10^{-12}$ J

a.) 1.89×10^{-12} J
b.) 9.43×10^{-13} J

b.) $u = \frac{Kq_1q_2}{r}$

$r = 20\times10^{-15}m$
$q_1 = e$
$q_2 = 82e$

$= \frac{9.0\times10^9 Nm^2/C^2(82e)(e)}{20\times10^{-15}m}$

$= 9.47\times10^{-13}$ J

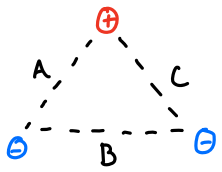
$E = \cancel{K} + u$
$E = u$

$u = 1.89\times10^{-12}$ J

$E_{total} = 1.89\times10^{-12}$ J $- 9.47\times10^{-13}$ J
$= 9.43\times10^{-13}$

Problems

28.P.6



$u = \frac{Kq_1q_2}{r}$

u_A : $\frac{9.0\times10^9 \frac{Nm^2}{C^2}(1.0\times10^{-9}C)(-2.0\times10^{-9}C)}{(0.03m)}$

$q_1 = 1.0\times10^{-9}C$

$q_2 = -2.0\times10^{-9}C$

$r = 0.03m$

$u_A = -6.0\times10^{-7}J$

u_B: $u = \frac{Kq_1q_2}{r}$ $\frac{9.0\times10^9 \frac{Nm^2}{C^2}(-2.0\times10^{-9}C)(-2.0\times10^{-9}C)}{0.03m}$

$r = 0.03m$

$q_1 = -2.0\times10^{-9}C$

$q_2 = -2.0\times10^{-9}C$

$u_B = 1.2\times10^{-6}J$

u_C: $u = \frac{Kq_1q_2}{r}$ $\frac{9.0\times10^9 \frac{Nm^2}{C^2}(-2.0\times10^{-9}C)(1.0\times10^{-9}C)}{(0.03m)}$

$r = 0.03m$

$q_1 = -2.0\times10^{-9}C$

$q_2 = 1.0\times10^{-9}C$

$u_C = -6.0\times10^{-7}J$

$u_f = u_A + u_B + u_C$

$= -6.0\times10^{-7}J + 1.2\times10^{-6}J - 6.0\times10^{-7}J$

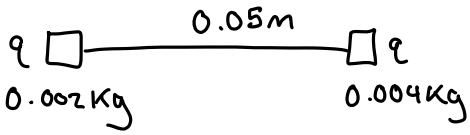
$= 0$

$u = 0$

2.P.36

$q = 2.0\times10^{-6}C$ $E = u$

a.)



$u = \frac{Kq_1q_2}{r}$: $\frac{9.0\times10^9 \frac{Nm^2}{C^2}(2.0\times10^{-6}C)(2.0\times10^{-6}C)}{(0.05m)}$

$u = 0.72\ J$

b.) $E = \frac{Kq_1q_2}{r^2}$: $\frac{9.0\times10^9 \frac{Nm^2}{C^2}(2.0\times10^{-6}C)(2.0\times10^{-6}C)}{(0.05m)^2}$

$E = 14.4N$

a.) 0.72 J
b.) 14.4 N
c.) $V_1 = 10.95$ m/s
$V_0 = 21.9$ m/s

c.) $K_i^{0} + u_i = K_f + u_f^{0}$

$P = mv$ $P_i^{0} = P_f$

$= m_0v_0 - m_1v_1$

$m_0v_0 = m_1v_1$

$u_i = K_f$

$0.72J = \frac{1}{2}m_0v_0^2 + \frac{1}{2}m_1v_1^2$

$0.72J = \frac{1}{2}m_0\left(\frac{m_1v_1}{m_0}\right)^2 + \frac{1}{2}m_1(v_1^2)$

$1.44J = m_0\left(\frac{m_1^2v_1^2}{m_0^2}\right) + m_1(v_1^2)$

$1.44J = \frac{m_1^2v_1^2}{m_0} + m_1v_1^2$

$1.44J = v_1^2\left(\frac{m_1^2}{m_0} + m_1\right)$

$\frac{1.44J}{\frac{m_1^2}{m_0} + m_1} = v_1^2$

$v_1 = \sqrt{\frac{1.44J}{\frac{m_1^2}{m_0} + m_1}}$

$V_1 = 10.95$ m/s

$V_0 = 21.9$ m/s

$V_0 = \frac{m_1v_1}{m_0}$

$V_0 = \frac{0.004Kg(10.95m/s)}{0.002Kg}$

$V_0 = 21.9$ m/s